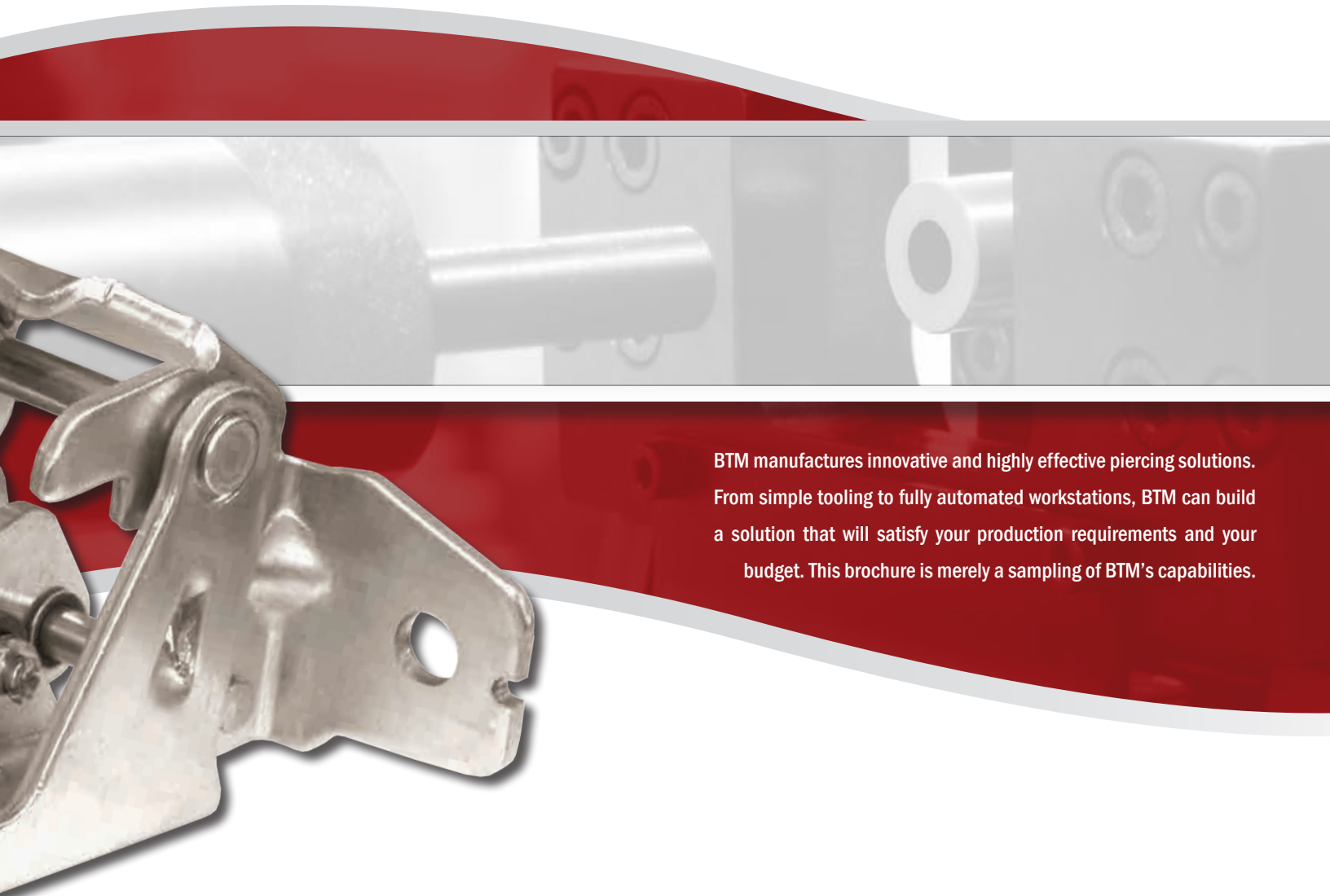


# Piercing Solutions

*General Capability Flyer: Piercing Applications*



BTM manufactures innovative and highly effective piercing solutions. From simple tooling to fully automated workstations, BTM can build a solution that will satisfy your production requirements and your budget. This brochure is merely a sampling of BTM's capabilities.

**BTM<sup>®</sup>**  
**COMPANY**

[www.btmcomp.com](http://www.btmcomp.com)

+1.810.364.4567

### Machine Building Capabilities of a World Class Status.

For over 50 years, BTM has specialized in offering innovative and highly effective industrial solutions at competitive prices. Our relentless pursuit of perfection has allowed us to grow into a world-class manufacturer with the ability to design and build machines to perform a variety of operations, including piercing, riveting, stamping, shearing, swaging, Tog-L-Loc<sup>®</sup> clinching,

adhesive dispensing, dimpling, and more. We can provide tooling, presses, fixtures, or even complete automated systems that combine processes.

BTM is committed to manufacturing the best products at competitive prices, and we stand by our solutions.

#### BTM strives to:

- Take an innovative approach to problem solving with emphasis on cost reduction
- Use our ability to combine processes such as clinching & clinch fasteners, riveting & feeding, piercing, forming, bending, adhesive dispensing, parts feeding & transfer
- Give attention to detail during project management
- Provide timely response to customer requests
- Accommodate running product design changes
- Make application of our time tested knowledge and experience
- Apply our knowledge of customer specifications

#### BTM stands by its products

Should you ever need service for one of our machines, BTM will provide a timely response to your request and provides an afterhours emergency telephone system. Just call our number and you will receive instructions for placing an emergency service request.

#### BTM World Headquarters

BTM's World Headquarters is located in Marysville, Michigan, USA, and has three main buildings.



**1** Manufacturing

**2** Special Products Division

**3** Standard Products Division

# PIERCING SOLUTIONS

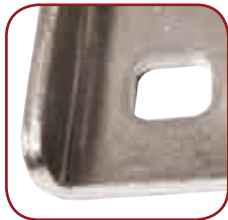
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Rectangular Hole



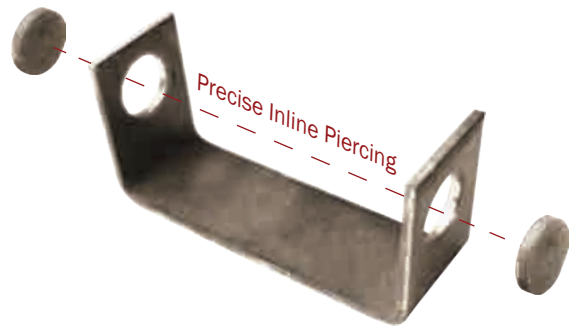
Circular Hole  
With Notch



Square Hole



Oblong Hole

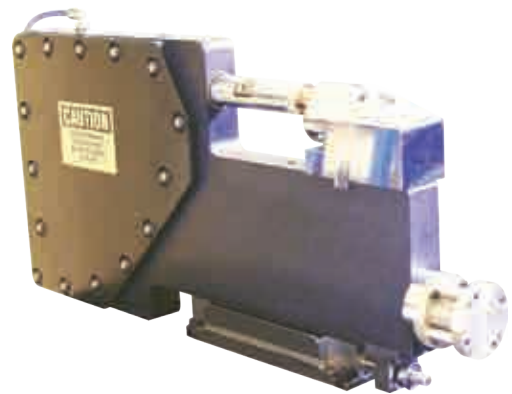


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## A one-stop pierce solution provider.

We offer a range of production equipment which includes an innovative thin-profile air toggle press, a line of Air-Over-Oil Cylinders, hydraulic solutions, and more. Our production equipment can be ordered separately, or it can be built into a fixture or system by BTM.

Contact one of our professional sales application engineers today for more information.



A Thin Air Toggle Press setup for Piercing.

Air Toggle Presses are a popular, and cost-effective solution when it comes to piercing. The thin profile allows for close stacking.

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**Note:** Any absence of guarding and/or safety controls in the photos contained within this brochure, does not absolve the customer from installing and implementing required safety features.

## PIERCING UNITS

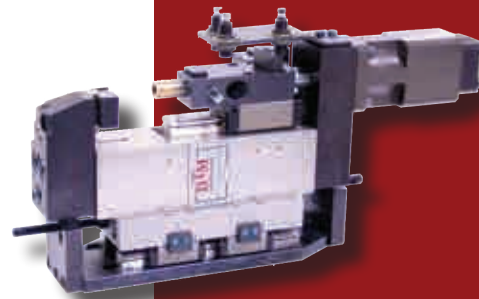
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BTM's piercing units are designed for use in special machinery and automation, and are ruggedly built for high volume production applications. BTM has a wide variety of designs available, as well as complete in-house capabilities to design and produce special units to suit your needs. BTM can provide your units fully tooled, tested, and ready to mount in your equipment. Using state-of-the-art computer aided design and manufacturing equipment, and working from your drawings and/or parts, we will design tooling and holders to suit your requirements.



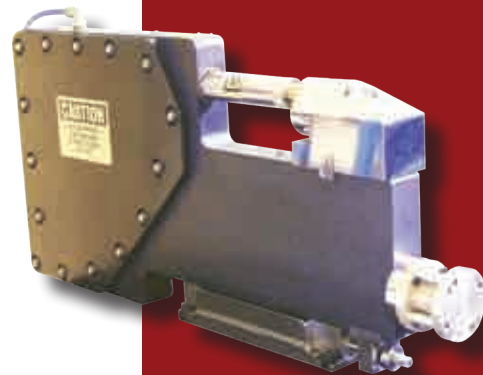
### Hydraulic Units.

BTM Hydraulic Press Units feature precision hydraulic cylinders with integrated compact force frames. A variety of bore sizes, strokes, and throat depths are offered. Non-rotating rams are available.



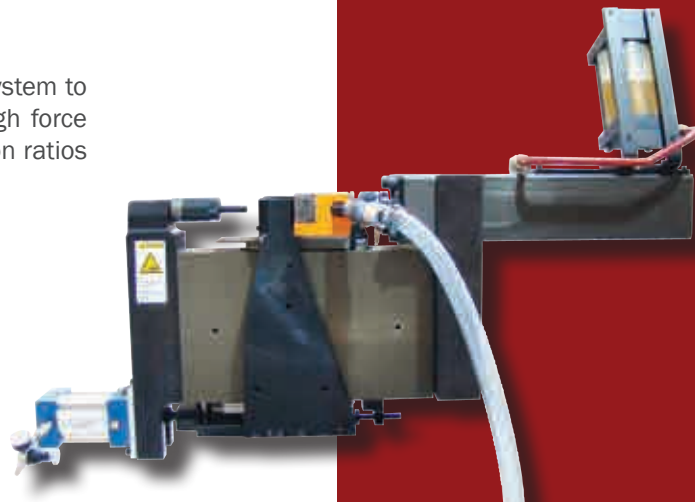
### Air Toggle Press Units.

BTM air toggle press units utilize a force multiplying toggle mechanism to produce high forces from 80 psi of air pressure while maintaining low air consumption. Models ranging from 1 to 40 tons are available. The compact, lightweight design (a 1 ton unit weighs 15 lbs.) is ideal for automation where the press unit must move within the machinery, and the unique thin profile allows positioning on close centers.



### Air-Over-Oil Press Units.

BTM air-over-oil press units employ a two stage system to produce a rapid advance stroke with a linear high force power stroke from shop air pressure. Multiplication ratios up to 64:1 are available.

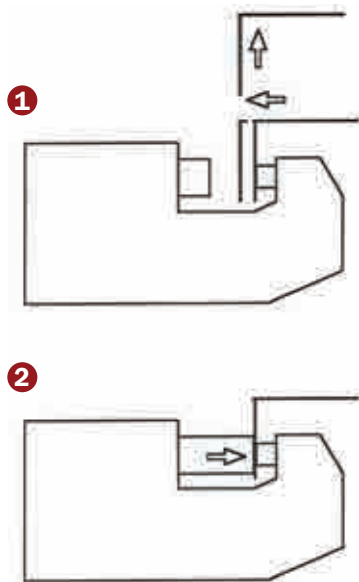


# UNIT FEATURES

- Fixed Mount -or-
- Equalizing Action -or-
- Reverse Equalizing Action -or-
- Spring Equalizing Action -or-
- Floating Action
- Hydraulic & water hydraulic
- Pneumatic
- Air-Over-Oil Cylinders
- Non-Rotating Rams
- Single or Multiple Tooling in One Unit
- Bank Units for Close Center Distance and Selectable Operation
- Offset Tooling for Close Part Conditions
- Reversible Tooling
- Quick Change Tooling
- Tooling for multiple simultaneous operations
- Robotic Mounting
- Load Cell and LVDT equipped for on-line process control
- Proximity Sensor Equipped
- Part Present Sensing
- Metric, SAE and BSP Porting
- Metric or Inch Versions

## Fixed Mount Units

For use where the workpiece is loaded by hand or automatically lifted.

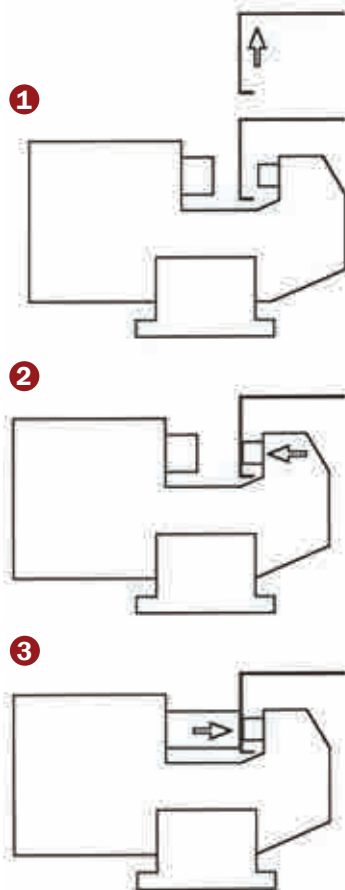


1. Open Position - Part Load & Unload.

2. Closed Position - Ram Advanced to Perform the Work.

## Equalizing Units

For use where the tooling must retract to clear flanges and for automated transfer.



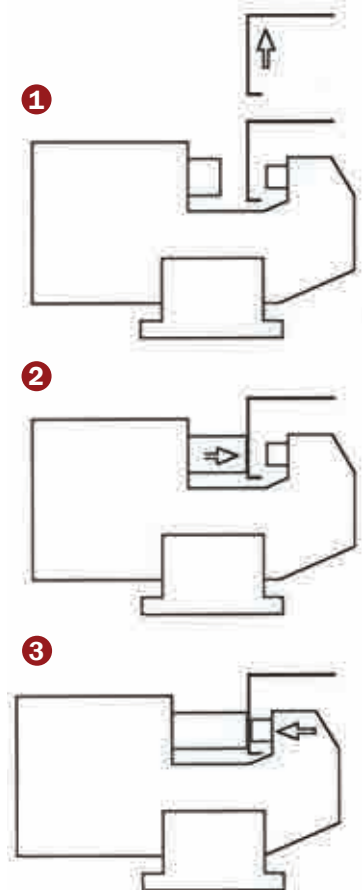
1. Open Position - Part Load & Unload.

2. Equalized Position - Unit body Equalized, Die Button Advanced to the Workpiece.

3. Closed Position - Ram Advanced to Perform the Work.

## Reverse Equalizing Units

Equalizing Units designed with ram mounted die button (punch on anvil side).



1. Open Position - Part Load & Unload.

2. Equalized Position - Ram & Die Button Advanced (Equalized) to the Workpiece.

3. Closed Position - Unit Body & Punch Advanced to Perform the Work.



# PIERCING FIXTURES

The four robotically loaded & unloaded fixtures shown here are designed to pierce and notch hydro formed tubing for a front automotive fender support structure.

## Machine One

Process: Pierce 13 holes, Create 2 tabs

Seven hydraulic units are used to pierce (3) 8.5mm holes, (5) 10 mm holes, (2) 20mm holes, and (2) 18mm holes, (1) 14x18mm slot, and creates (2) 4x15mm tabs.



## Machine Two

Process: Pierce 3 holes,  
45x84mm shear w/ 10mm radii

Three hydraulic units are used to pierce (3) 10mm holes, and shear (1) 45x84mm end with 10mm radii.

## Machine Three

Processes: Pierce 12 holes, Create 2 tabs

Seven hydraulic units are used to pierce (2) 20mm holes, (2) 18mm holes, (6) 10mm holes, (1) 8.5mm hole, (1) 14x18mm slot, and create (2) 4x15mm tabs.



## Machine Four

Processes: Pierce 1 hole,  
45x84mm shear w/ 10mm radii

Two hydraulic units are utilized to pierce (1) 10mm hole, and shear (1) 45x84mm end with 10mm radii.

# PIERCING WORKSTATIONS

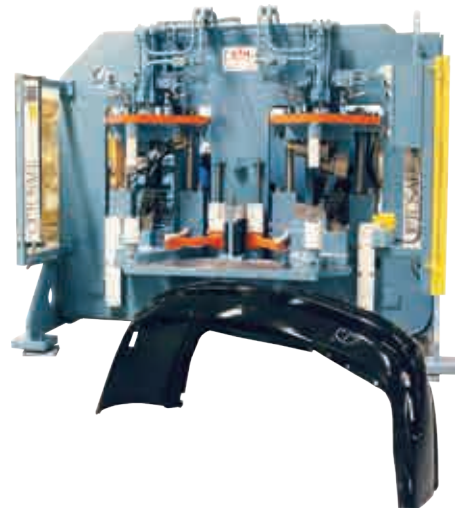
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## Plastic Bumper Piercing

Process: Piercing

This machine was specially designed and built to pierce holes in an ABS plastic bumper.

BTM can design and build machines to pierce a range of materials including, but not limited to steel, aluminum, copper, brass, many plastics, and more.



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## Automotive Trim Piercing

Process: Pierces the mounting holes in a stainless steel drip molding.

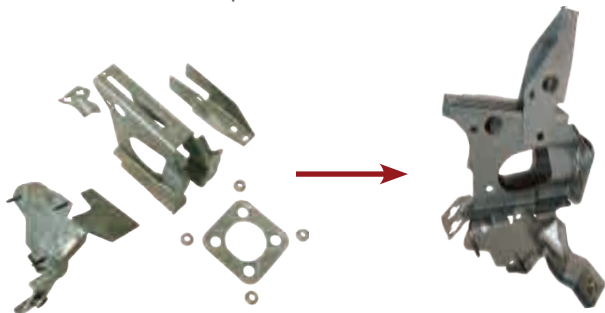


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## Brake Pedal Bracket Assembly

Process: Tog-L-Loc® clinching & In-Line Piercing

This machine combines the Tog-L-Loc® sheet metal joining system with piercing to assemble a brake pedal bracket consisting of 9 components. An operator uses a separate workstation to join a sub-assembly. The remaining pieces are then loaded into the main machine which utilizes a dial table to transfer the parts through Tog-L-Loc® and in-line piercing stations to achieve GD&T requirements.



## CUSTOM SOLUTIONS

BTM excels at creating custom solutions for our customers. We utilize cutting-edge engineering and machine building equipment and back it with over 40 years of experience to ensure that our customers get the best solutions possible, and for the best price. We believe in customer satisfaction, and will work with you through every step of the process to ensure that your custom solution is exactly the right solution for your production needs.

Whether you desire a simple operator dependant machine or a complex multi-process automated assembly solution, BTM has the capability, experience, and innovative problem solving ability that is necessary to create outstanding production equipment.

The examples shown on the following pages are a mere sampling of some of the innovative custom solutions that BTM has built over the years to perform piercing applications. Contact a BTM sales application engineer to find out how BTM can build a solution that will satisfy your piercing needs.



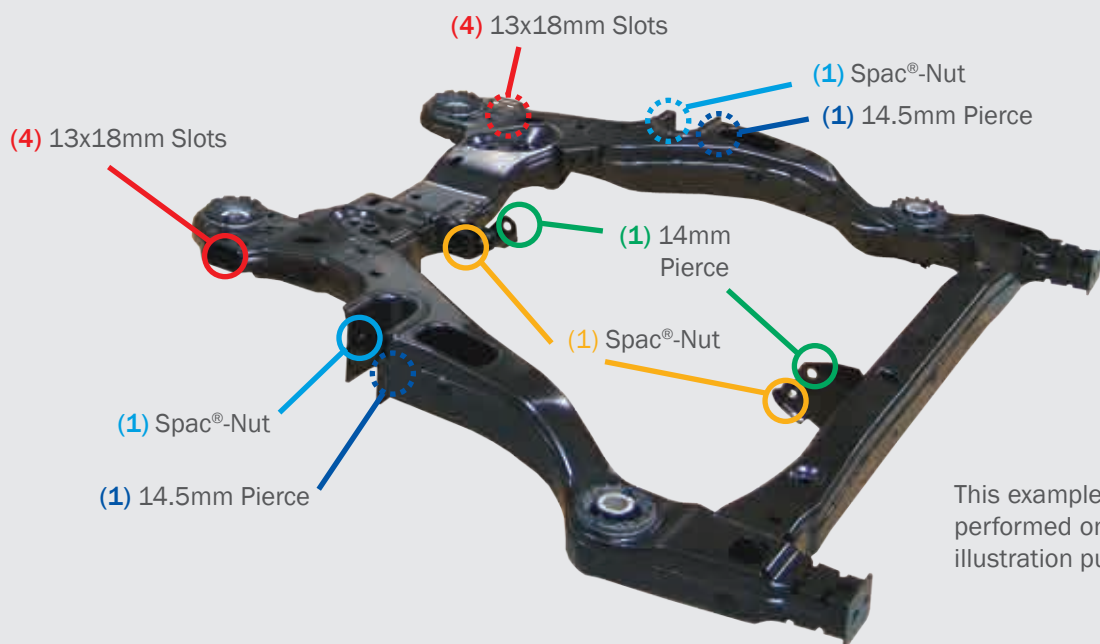
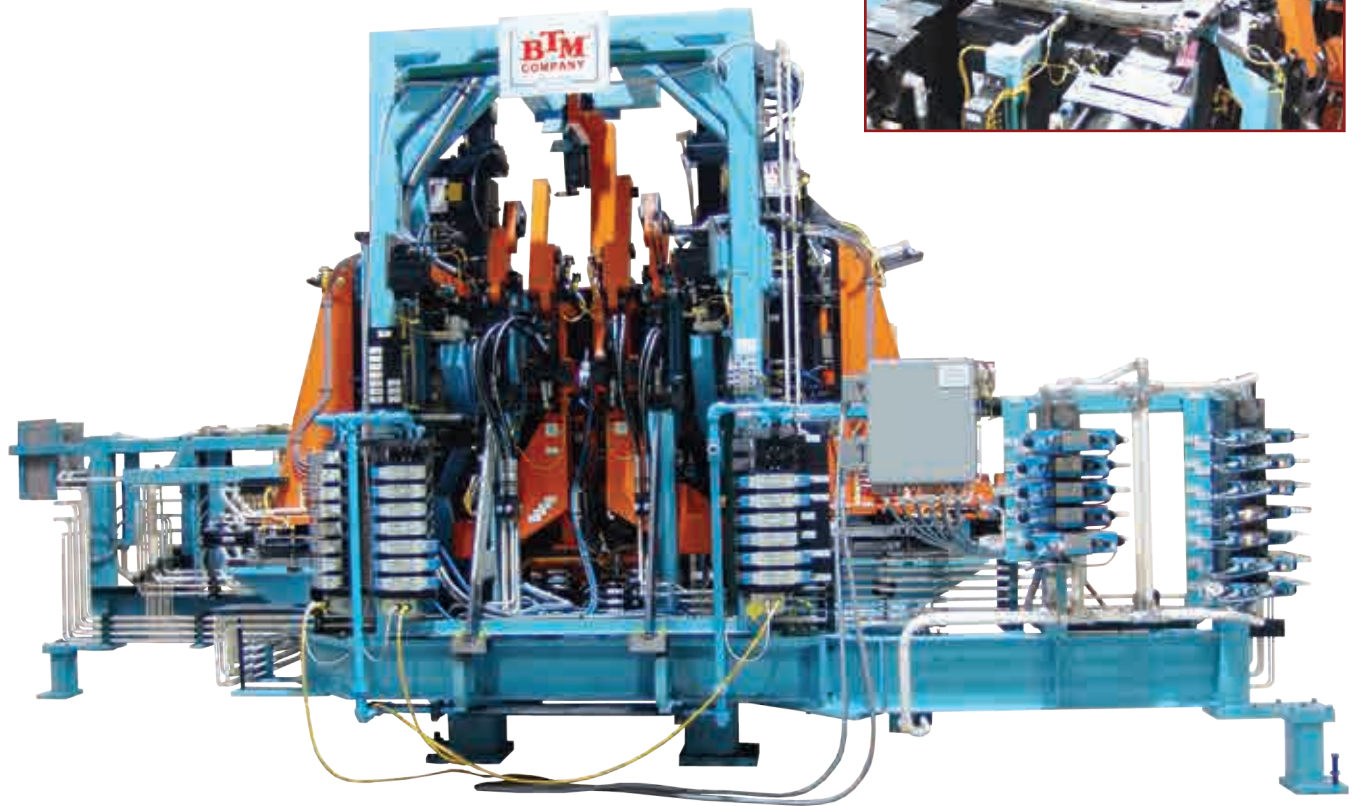
### Truck Frame Piercing

Process: Final frame pierce of cab, box, body, and control arm mounting holes in three different truck frame versions.



## Front Cradle Piercing - An Example in Flexible Manufacturing

The customer needed a solution which could pierce and insert Spac<sup>®</sup>-Nuts into a front cradle assembly. The customer's requirements dictated that the machine fit within a confined area along with other stations which are all robot loaded and unloaded. As an added design challenge, it had to be able to accommodate both an SUV and a car's front cradle.



This example combines operations performed on each front cradle for illustration purposes.

## Truck Frame Piercing

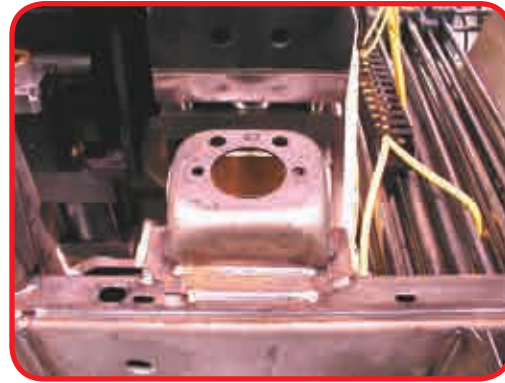
Process: Post pierce the front suspension, cab and box mounting holes in a welded, high strength steel frame and accommodate 1 SUV and 2 truck frames automatically to achieve GD&T requirements.

BTM designed and built this highly reliable pierce station to accommodate both Body Mount and Front Suspension Holes in a Single Station with automatic change over for piercing both Truck and SUV frames.

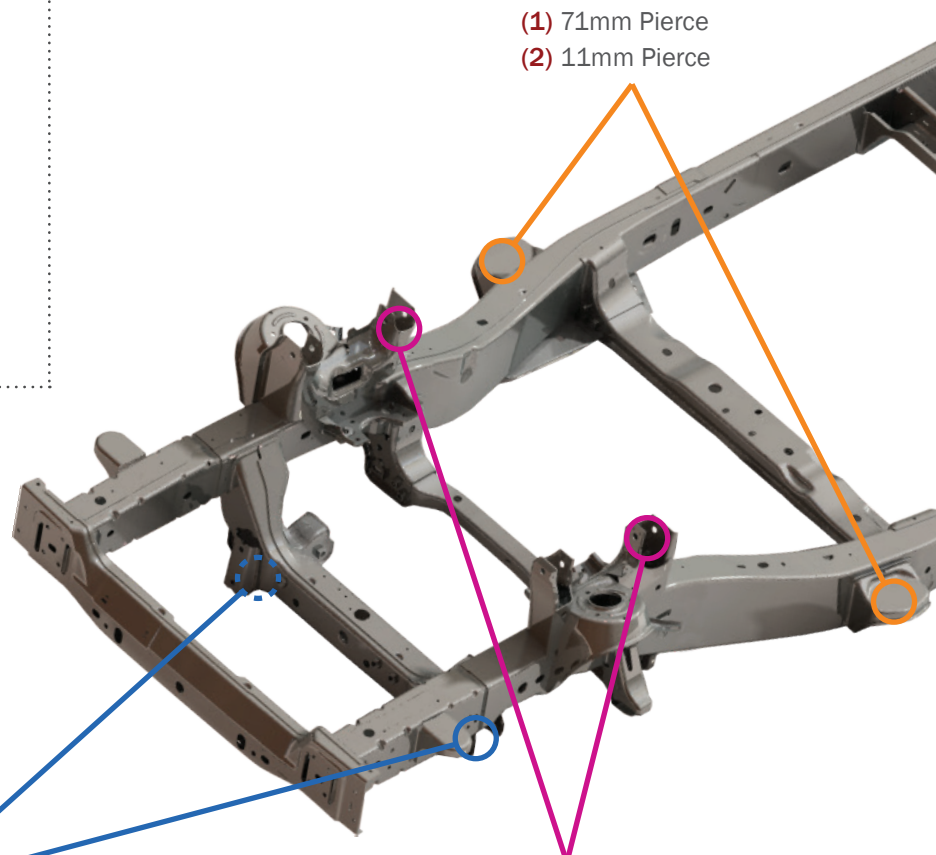
Special tabs and lances are incorporated into the pierce tools for the front suspension holes. Several different body mount bracket designs were also accommodated.

Dual action pierce units were utilized to gain clearance with the frame brackets to permit easy automated transfer.

Design consideration was also given to withstanding harsh conditions created by sometimes excessive weld spatter.



- (1) 71mm Pierce
- (2) 16mm Pierce
- (2) 11mm Pierce



- (1) 71mm Pierce
- (2) 11mm Pierce

**Simultaneously pierce and lance four control arm mounting holes in-line for upper & lower control arms.**

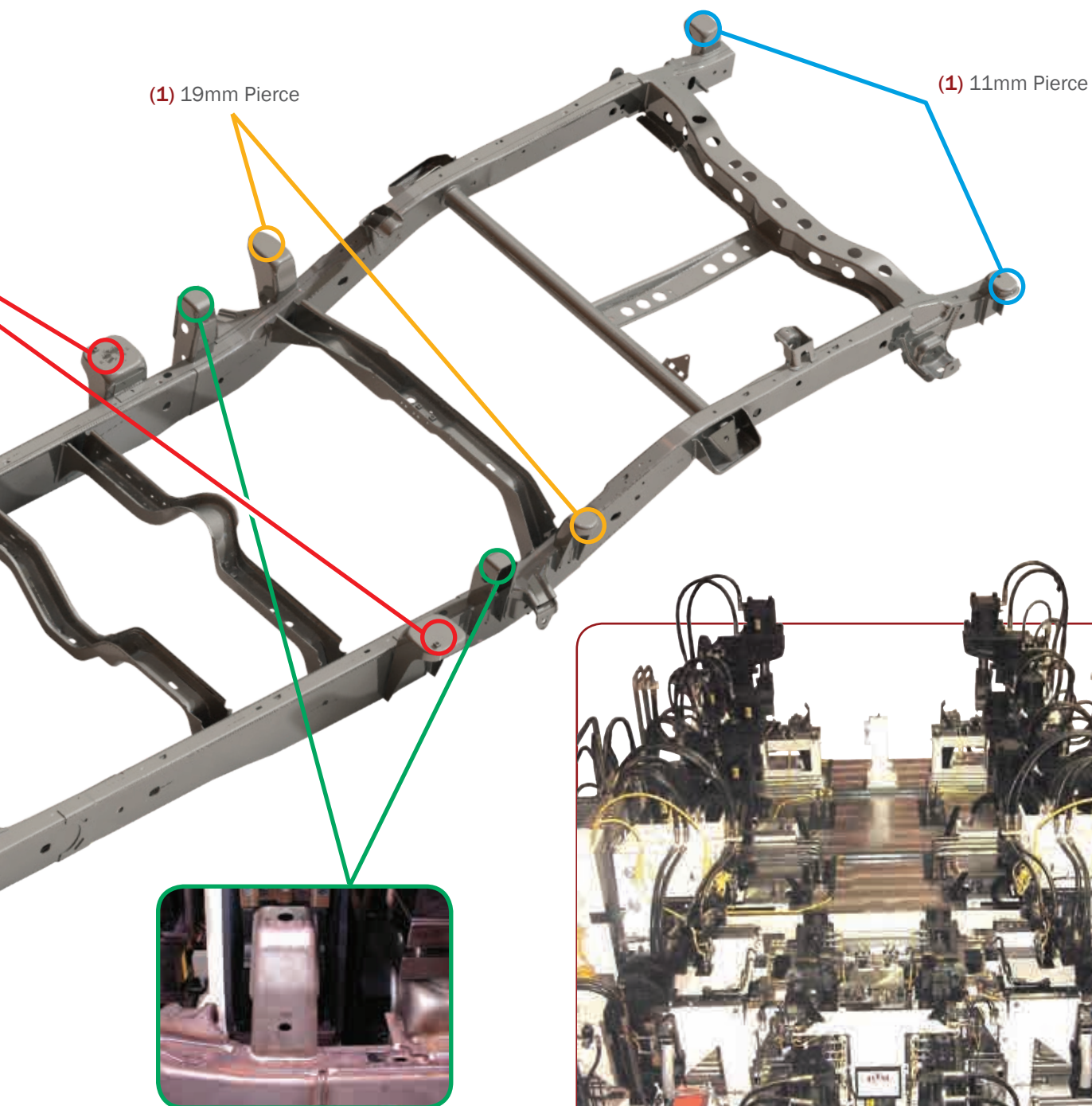


- (1) 14.3x28.5mm Pierce
- (2) Anti-Rotation Lances

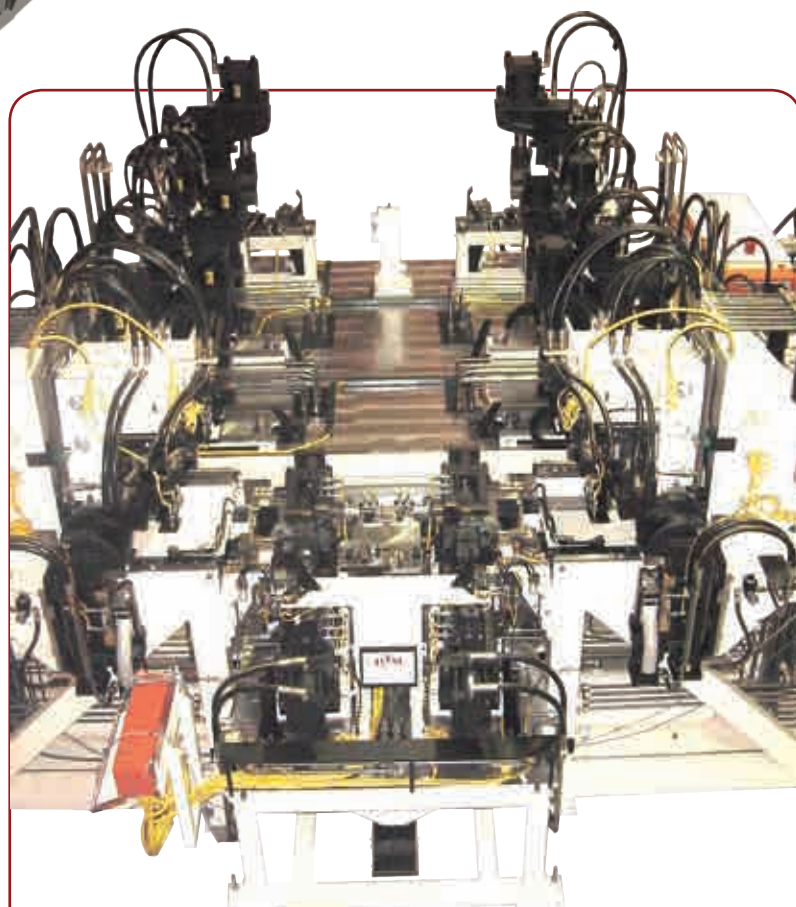


- (2) 15mm Pierce
- (2) Anti-Rotation Lances





(1) 19mm Pierce



### Flexibility

In addition to the truck frame featured on these two pages, this machine can easily and quickly adapt to accommodate an extended cab and an SUV frame.

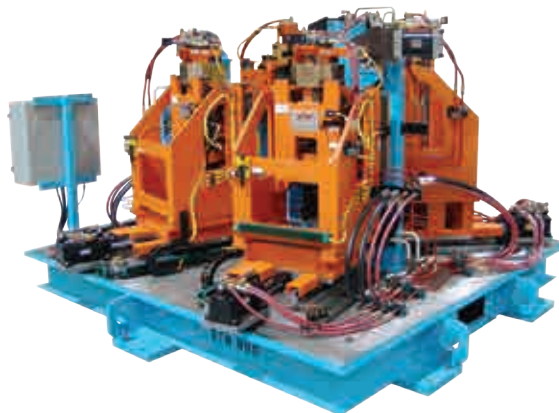
# SUV CRADLE PIERCING

Process: Pierce front and rear cradles for an SUV.

BTM built six special machines to efficiently perform the task in a robot loaded production cell.

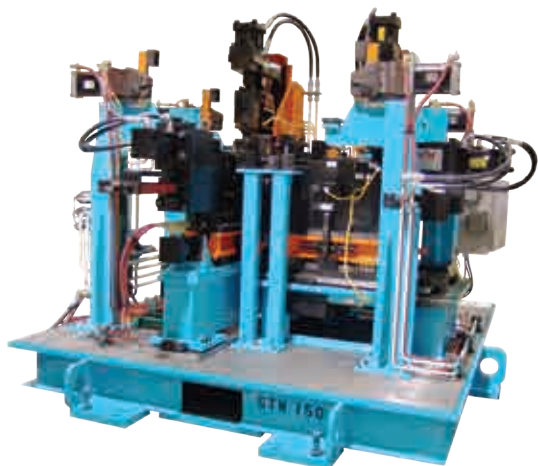
## Front Cradle Operations

BTM Built three special machines to perform operations on the front cradle within an assembly cell.



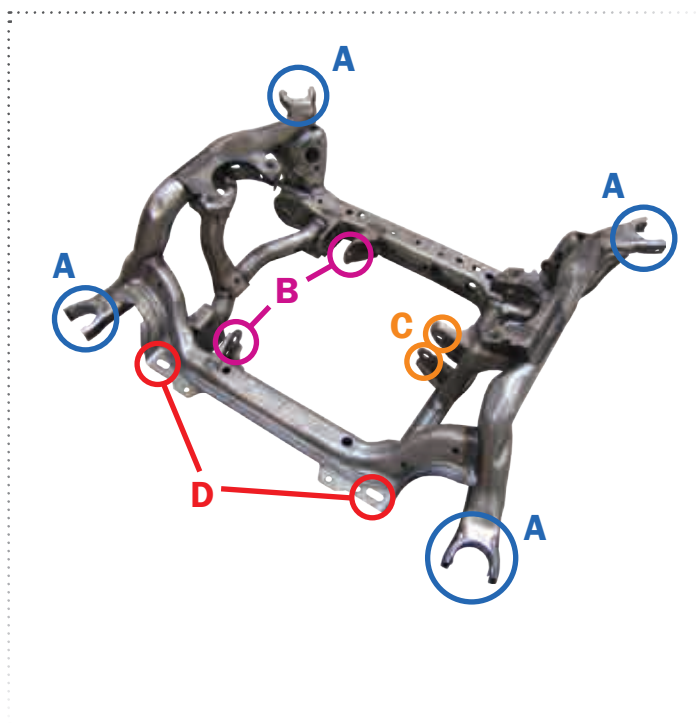
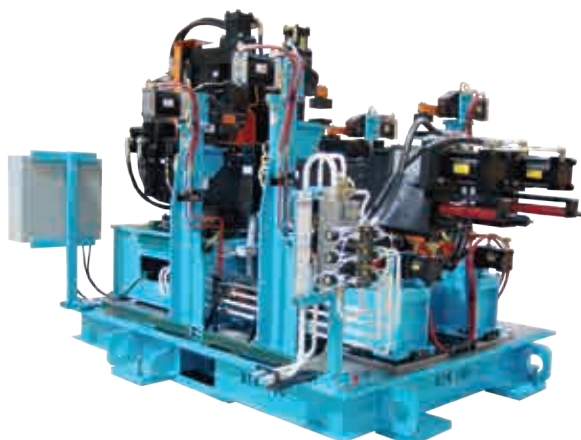
**Station One [Trim/Shear]:**  
[A] (1) 140mm trim/shear  
(4 locations)

[to widen the “u” shape at the denoted locations of the part.]



**Station Two:**

- [B] (1) 13.25mm Hole (2 locations)
- [C] (1) 10.3 x 14mm Slot (2 locations)
- (1) 25 x 35mm Slot (not shown)
- (1) 25mm Hole (not shown)



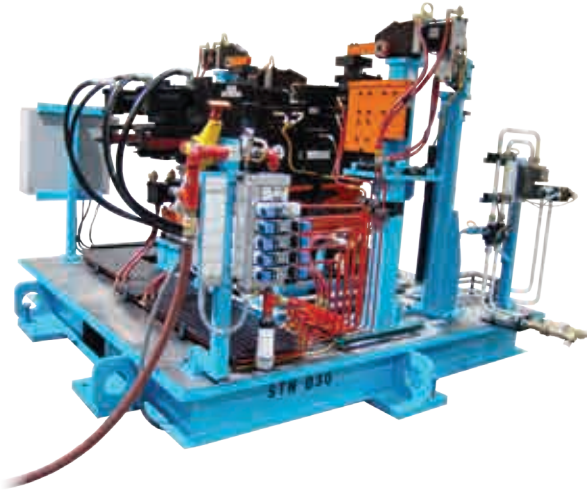
**Station Three [Piercing]:**

- [D] (2) 14.2 x 32mm Slots
- (2) 14.2mm Holes (not shown)
- (4) 14.2 x 32mm Slots (not shown)



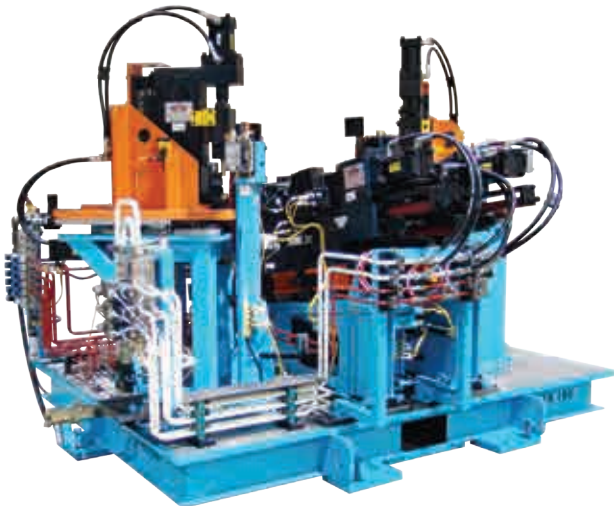
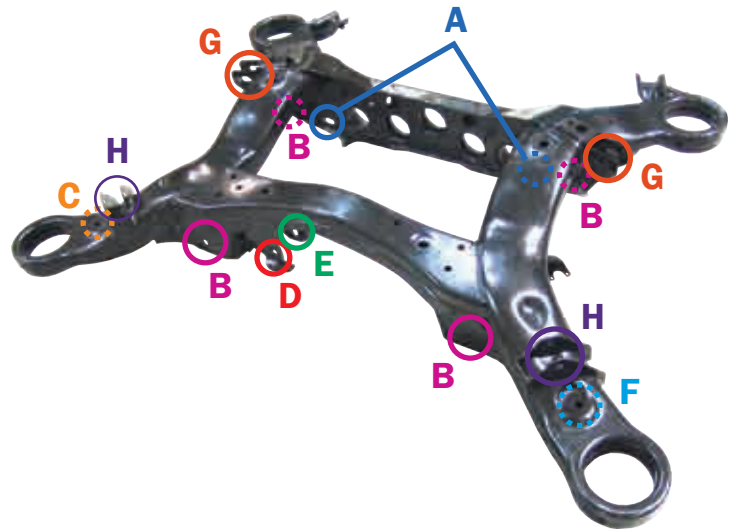
## Rear Cradle Operations

BTM Built three special machines to perform operations on the rear cradle within an assembly cell. The type of work and the location that the work was performed on the part is denoted below.



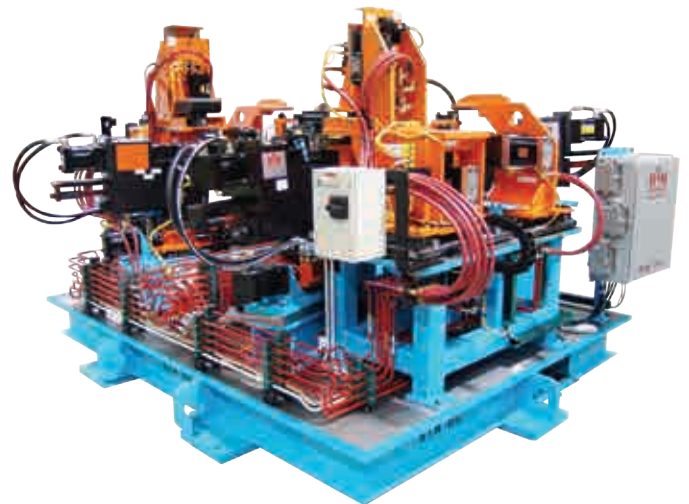
### Station One:

- [A] (1) 13.4 x 25.2 Inline Slots (2 locations)
- (4) Anti-Rotation Lances (not shown)



### Station Two:

- [B] (2) 14.2mm Inline Holes (4 locations)
- [C] (1) 20.0x26.0mm Slot
- [D] (1) 12.2mm Hole
- [E] (1) 13.25mm Hole
- [F] (1) 20.0mm Hole



### Station Three:

- [G] (2) 12.1 x 23mm Inline Slots (2 locations)
- [H] (2) 12.1mm Holes (2 locations)
- (8) Anti-Rotation Lances (not shown)

## COMBINED PROCESSES

BTM can combine piercing with other processes including Tog-L-Loc® and/or Lance-N-Loc® sheet metal clinching, riveting, shearing, swaging, dimpling, notching, bending, stamping, spac-nut insertion, adhesive dispensing, and more. BTM is a full service design and build shop dedicated to customer satisfaction. We have the capability and the experience to create a streamlined multi-process solution for your unique production application. Listed here are but a few processes BTM can manufacture solutions for. Contact a sales application engineer to find out how BTM can assist you in combining processes to improve efficiency and decrease production cost.

### Tog-L-Loc® Sheet Metal Joining

Tog-L-Loc® is a cold forming clinch process which can join sheet metals without the use or assistance of external fasteners or welding. Tog-L-Loc® utilizes a patented punch and die which form a strong, vibration-resistant, mechanical interlock using only the metals of the part. The Tog-L-Loc® clinching process is naturally green because it produces no fumes, harmful heat, shavings, or soot. The process also introduces no external fasteners, which means no additional cost is added to a part during the clinching process. Tog-L-Loc® is well suited to join a range of metals including galvanized, pre-painted, and dissimilar combinations. The process is also fast, using only one single press stroke.

Punch Side



Die Side



Package Tray



Gas Tank Straps

### Lance-N-Loc® Sheet Metal Joining

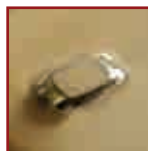
Lance-N-Loc® is a sheet metal clinching system which creates a strong mechanical joint without the use of external fasteners or welding. The metals are lanced and squeezed to form an interlock below the bottom layer of the sheet metal.

Lance-N-Loc® is good for joining harder materials, multiple layers, and is ideal for use where electrical conductivity is required.

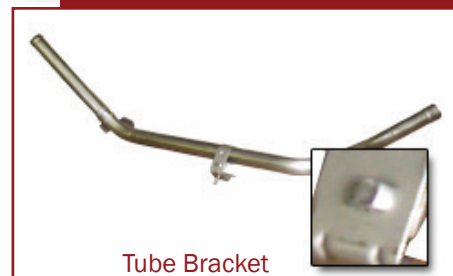
Punch Side



Die Side



Duct



Tube Bracket

## Swaging

BTM created a custom dieset to swage the tubes into the plate while keeping it distortion free.



## Shearing

BTM can shear a range of materials, at a variety of sizes. The part shown below is a trunk liner which has been notched to incorporate a CD changer.



## Notching

Accurate hole location adjustment is accomplished in this heavy gauge steel. Notch location is adjustable for error proofing.



## Lancing

Anti-rotation lances can be combined with piercing, as was accomplished in the example shown to the right.



## Dimpling

Should your part require a dimple, BTM can create a cost-effective solution to meet your specific needs.



## Bend & Tab

BTM pierced and bent this tab in one operation.



...and more...



**BTM has a range of products for automation including:**

### **Clamps**



From heavy duty precision sealed locking power clamps to simple light duty OMNI models, BTM manufactures clamps in a range of styles and sizes for a wide variety of applications.

### **Grippers**



BTM manufactures a high quality line of grippers ranging from heavy duty models to light duty models in a variety of styles and sizes.

### **Locator Clamps**



BTM's Locator Clamps are ideal for locating & holding production material and are used in a variety of manufacturing areas including automotive & refrigeration. Locking and Non-Locking Pin and Finger models available.

### **Precision Shot Pin Cylinders**



BTM's Precision Shot Pin Cylinders are ideal for locating production material through precisely pierced holes - including clamping and fixturing.

### **Air Toggle Presses**



BTM's THIN Air Toggle Presses can be configured for a range of applications including Tog-L-Loc® clinching, piercing, riveting, and bending. Thin profile allows for close stacking. Available in a range of sizes and styles.

### **Air/Oil Cylinders**



BTM Air/Oil Cylinders generate high forces with shop air pressure to perform various press operations. They can be used with many types of tooling, including Tog-L-Loc®, Piercing, Riveting, Crimping, Stud insertion and Bending.

### **Specialized Units**



BTM provides pneumatic, hydraulic, air/oil, and electrically driven units with single or dual motions for both stationary and robotic applications.



For more information, or to view our other products, please visit:

**[www.BTMCOMP.COM](http://www.BTMCOMP.COM)**